Work and Energy

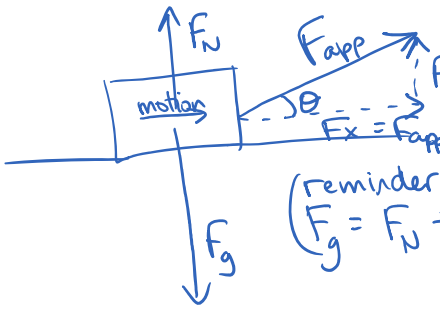
October 24, 2017 12:35 PM

✡ scalars, but can be + (gain) or − (loss)

$$W = \Delta E = E_{kf} - E_{ko} = E_{pf} - E_{po}$$

$$E_p = mgh \qquad E_k = \tfrac{1}{2}mv^2$$

✡ $W = Fd$ → Force and distance must be parallel or must find parallel component



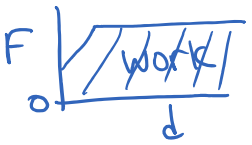
✡ Total work = (Force applied in direction of motion)(distance moved) = Work "in"

↖ don't subtract away friction, etc

$W_{net} = F_{net}\,d$ = work "out"

↖ after you've subtracted friction, etc

✡ Area under a F vs d graph = work



✡ $W_{total} = \Delta E_{total} = F_{app}\,d$

$\Delta E_k = F_{net}\,d$ (= $(F_{app} - F_f)$) $\qquad \Delta E_{heat} = F_f\,d \qquad F_f = \mu F_N$

✡ Power = $\frac{\text{work}}{\text{time}} = \frac{W}{t} = \frac{\Delta E}{t}$ ← work

$\left[\frac{J}{s}\right] = [\text{Watts}] = [W]$ ↑ unit watt

Fd

unit watt

$$= \frac{Fd}{t}$$

$$\boxed{P = Fv}$$

✡ $\text{Efficiency} = \frac{W_{out}}{W_{in}} \times 100\%$ $\quad$ in > out

$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100\%$ $\quad$ bigger # on bottom

"in" = how much is used by the process

"out" = " " " accomplished by the process

✡ hp conversions

750 W = 1 hp

hp is a unit for power, just like Watts

ex $\quad 5\text{ hp} = ?\text{ W}$

$$5\text{ hp} \times \frac{750\text{ W}}{1\text{ hp}} = 3750\text{ W}$$

ex $\quad 3762\text{ W} = ?\text{ hp}$

$$3762\text{ W} \times \frac{1\text{ hp}}{750\text{ W}} = 5.016\text{ hp}$$

✡ Practice pg 95, 98, 99, 100, 101

key pg 82 | key pg 83 | 1. 2.6×10^3 J, 2a) 0.036 J | 1. 2.25 MJ, 2a) 751 W, b) 1.00 hp

pg 82 pg 83

1. 2.6×10 J

2a) 0.036 J

b) $2.7\ m/s$

b) 1.00 hp

3. 39.2 s